

# Editorial

---

## Towards globalization of biodiversity

Charles S. Elton is considered the father of the biology of invasive species. His seminal book *THE ECOLOGY OF INVASIONS BY ANIMALS AND PLANTS*, first published in 1958, is still considered a classic and compulsory reading for anyone interested in this fast growing branch of ecology. Dispersal is a natural process, a part of evolution and ecology. In the case of plants, it generally takes place through seeds or spores, while in vertebrates it is mostly through the movement of adult animals. Few immigrants survive the hazards of the 'new world', competition from the native species and stochastic forces. Only a small percentage becomes naturalized, most die off due to natural causes. Some naturalized species do become invasive (Mack *et al.* 2000). It is these species we will discuss in this editorial.

All along our evolutionary history and travel, we human beings have helped in the spread of non-indigenous species into new territories. Perhaps some of the first species to travel to new territories with us were the goats, dogs and cereals. For millennia, we have served as both accidental and deliberate dispersal agents. This phenomenon is increasing exponentially with the increase in international travel and commerce. Non-indigenous species are appearing in new areas at a rate never seen in the history of this planet. This is resulting in the creation of homogenous ecosystems, with the same species of plants and animals everywhere. Distances are disappearing, barriers are breaking down and the world is becoming a global village – we are seeing the globalization of biodiversity. Or, to put it better, the globalization of monocultures. We find *Eucalyptus* spp. plantations everywhere, and most of the tropical wetlands are choked with Water Hyacinth *Eichhornia crassipes*.

In India, the environmental and socio-economic impacts of alien invasive species such as the Water Hyacinth, Lantana *Lantana camara*, Mesquite *Prosopis chilensis*, Water Lettuce *Pistia* sp., Scotch Broom *Cytisus scoparius*, and Congress Grass *Parthenium hysterophorus*, are evident to foresters and conservationists. Estimates of economic damage caused by invasives are not available for India. The cost of control of such invaders in USA exceeds \$138 billion per year (Mack *et al.* 2000). Globally, almost 20% of the vertebrates thought to be in danger of extinction are threatened in some way by invasive species. The single biggest tragedy is the probably the loss of at least 200 of the 300 endemic cichlid species in Lake Victoria as a result of the introduction of the Nile Perch *Lates niloticus* to the lake (Lowe-McConnell 1993). In India, the impact of *Tilapia*, a fish brought from Africa, on the native fish fauna is not properly studied. This invasive species was deliberately introduced in the Western Ghats where some of the most endangered and endemic fish fauna are found. Since 1800, invasive species have entirely or partially caused the majority of bird extinctions (BirdLife International 2000). Virtually all these extinctions were of island birds lacking natural defences against introduced predators particularly rats, cats and mongooses. Introduced competitors, herbivores and plants impact on 72, 71 and 69 globally threatened species respectively. The highly restricted-range Narcondam Hornbill *Aceros narcondami*, found only on the 7.5 sq. km Narcondam Island, is negatively impacted through over-grazing by the semi-feral goats which are damaging forest regeneration. If these feral goats are not eliminated, it is estimated that in another 80 years there would not be enough old *Ficus* trees for these hornbills to nests (Ravi Sankaran, *pers. comm.* 2002). The negative impact of introduced Chital *Axis axis* on forest ecosystems on the islands of Andaman and Nicobar is well known and needs immediate action.

The impacts of various invasive species need urgent attention from the Government of India, as the problem is growing with the accelerated rate of species movements through trade, transport, travel and ballast water. The latter is considered to be the most important vector for trans-oceanic and inter-oceanic movements of invasive marine organisms. Good scientific knowledge and understanding of how alien species become harmful to ecosystems and to species is a prerequisite for adequate mitigation measures. This is a branch of ecology on which not much attention has been given by Indian scientists and conservationists. We do not even have a clear-cut policy on the introduction of non-indigenous species. Australia has recently adopted a national weed policy aimed at reducing the impact of plant invaders and South Africa is determined to clear all the invasive woody species from its river catchments in a 20 year programme (Mack *et al.* 2000). The National Wildlife Action Plan 2002-2016 (Ministry of Environment and Forests 2002) devotes one line to the problem of invasive species, while the draft National Environment Policy: 2004 of the Ministry of Environment and Forests is silent on this issue.

Article 8(h) of the Convention on Biological Diversity requires parties “as far as possible and as appropriate, [to] prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species”.

Invasive species are also known to cause major economic losses in agriculture, forestry and several other segments of Indian economy and these losses should be systematically assessed through appropriate criteria and indicators. Some rough estimates, based on some simplistic and selective criteria, indicate economic and environmental losses to exceed US \$ 115 billion per year (Pimentel *et al.* 2001). These estimates, however, require validation based on proper socio-economic surveys conducted for this purpose (Rana 2004).

We have many laws which are supposed to prevent the introduction, accidental or intentional, of non-native species. Some of the laws are as follows:

The Destructive Insects and Pests Act, 1914 (amendments in 2001)

The Plants, Fruits and Seeds Order, 1989 (amendments in 2001)

The Seeds Act, 1966 (and the Seeds Rules, 1968)

EXIM Policy 2002-2007

Indian Livestock Importation Act, 1898 (amendments in 2001)

The Fisheries Act, 1897 (along with State Fisheries Acts)

The Protection of Plants Varieties & Farmers Rights Act, 2001

However, these laws are either flawed or outdated, and generally not seriously implemented. The National Biodiversity Strategy and Action Plan (2004) recommends enactment of legislation to establish an autonomous Quarantine Authority of India, to control the entry of alien invasive species. Considering that the scope of dealing with invasive alien species is multi-dimensional and requires multi-disciplinary inputs, there is an urgent need for establishing the National Invasive Species Council.

ASAD R. RAHMANI

#### FURTHER READING

BIRDLIFE INTERNATIONAL (2000): Threatened Birds of the World. Lynx Edicions and Birdlife International, Barcelona and Cambridge, UK.

ELTON, C.S. (1958): The Ecology of Invasions by Animals and Plants. Methuen, London.

LOWE-McCONNELL, R.H. (1993): Fish faunas of the African Great Lakes: origin, diversity, and vulnerability. *Conservation Biology* 7: 634-643.

MACK, R.N., D. SIMBERLOFF, W.M. LONSDALE, H. EVANS, M. CLOUT & F.A. BAZZAZ (2000): Biotic invasions: Causes, Epidemiology, Global Consequences, and Control. *Ecological Applications* 10(3): 689-710.

MINISTRY OF ENVIRONMENT AND FORESTS (2002): National Wildlife Action Plan: 2002-2016. Ministry of Environment and Forests, Government of India. New Delhi, pp 46.

RANA, R.S. (2004): Invasive alien species and biodiversity: Indian Perspective. *In*: National Biodiversity Strategy and Action Plan (Ed.: Kothari, Ashish). Ministry of Environment and Forests, Government of India and Kalpavriksh, New Delhi and Pune.

PIMENTEL, D., S. MCNAIR, J. JANECKA, J. WIGHTMAN, C. SIMMONDS, C. O'CONNELL, E. WONG, L. RUSSEL, J. ZERN, T. AQUINO & T. TSOMONDO (2001): Economic and environmental threats of alien plant, animal and microbe invasions. *Agric. Ecosys. Environ.* 84: 1-20.